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NATIONAL RESEARCH COUNCIL

REPORT OF THE ASTRONOMY COMMITTEE

The present report relates only to the scientific needs of Astronomy. Its applications to the possible services that astronomers can render in the war, as a part of the work done by the National Research Council in connection with the Council of National Defense, will be made the subject of a separate study.

The report of the Committee on Astronomy of the Committee of One Hundred (*Science*, 45, 135) gives the views of a majority of the members of the present Astronomy Committee. It shows the uses that could be made at once of a fund for astronomical research. They need not all be repeated here, but two are of such importance and general application that attention may be called to them.

First, aiding existing southern observatories, or establishing new observing stations to render our knowledge of the southern stars comparable with that of the northern stars. As the resources of northern observatories are far greater than of those south of the Equator, much might be accomplished by taking photographs of the southern stars, and sending them north for measurement, reduction, and perhaps discussion.

Secondly, securing the aid of very large reflectors, both north and south, for the extension of nearly every research to very faint stars. This is especially the case in clusters, or other objects, where photographs with short exposures would furnish material for prolonged study. Experts all over the world might thus be provided with material of the greatest value, while the owners of the telescopes would have the satisfaction of having their photographs discussed by those best qualified to do so. The continuation of the investigation with large reflectors of the radiation of stars and planets is regarded by many as of paramount importance.

Letters are published in *Science*, 41, 82, giving the needs of twelve leading American astronomers. In almost every case, the demand was for more assistants to aid in extensive routine observations. A relatively very large increase of output could thus be secured. Six of these astronomers are members of the present Committee.

The publication each year of a brief statement of the work done by every American observatory engaged in research, as is now done by European observatories, would aid greatly in forming plans for coöperation.

Examples are given below of large routine investigations needed at the present time. Several of them, such as 2, 4, 8, 17, and 20, are already making excellent progress, according to a definite system. In many cases, plans could best be carried out by small committees of experts. The American Astronomical Society, which, with few exceptions, includes among its members all the leading astronomers of the country, has already appointed several such committees.

For statistical purposes, it is very desirable to include all stars brighter than a given magnitude. This limit is often that for which the desired observations can be obtained. If not, stars of special interest should be included, and in some cases a fixed number of stars of each fainter magnitude. Preference should here be given to the standard regions adopted at Groningen and Harvard.

1. The absolute positions of the stars from observations of the Sun, Mercury, and Venus. These objects are difficult to observe visually, and a trial of photographic methods, either by direct measurement, or by a photographic transit circle, is suggested.

2. Positions of all stars of the ninth magnitude, and brighter, with photographic doublets.

3. Precise positions of standard stars, generally of about the ninth magnitude, needed for the reduction of No. 2. Each star should be observed with transit micrometers, attached to first class meridian circles, on at least three nights at two observatories, if feasible. The aid of national observatories should be secured in this work, since they are best qualified to undertake it. These stars should be selected whenever possible from the list of intermediary stars of the Comité International Permanent. Nos. 2 and 3 should be carried on simultaneously.

4. Proper motions of all stars of the magnitude 7.5, or brighter.

5. Proper motions of stars in spiral, and other, nebulae.

6. Restoration of the stations for determining variations in latitude both visually and photographically.

7. Sufficient measures of all known double stars to determine the relative positions of the components, and if they have perceptible motions to furnish adequate material for an orbit. In the first case, these observations should be made with three telescopes, with a computed probable error not exceeding $\pm 0''.05$. These observations should be repeated every ten years, or, in the case of known binaries of short period, more frequently. For many stars, the material needed already exists.

8. Parallaxes of all stars of the sixth magnitude, and brighter, and of a selected list including variables, stars having large proper motion or parallax, binaries, nebulae, etc. The same stars should be observed with several telescopes to eliminate systematic errors, as far as possible. Some clusters, and stars of Class B, whose parallaxes are presumably small, should therefore be included.

9. Precise positions by modern methods, photography and transit micrometer, of the Moon and major planets.

10. Orbits and ephemerides of asteroids and comets so far as this is not provided for by the Rechen-Institut. The loss of a faint asteroid may sometimes be avoided by promptly computing a circular orbit for it.

11. Spectra of special stars too faint to be classified on existing photographs. They can probably be obtained by a focal plane spectroscope, or objective prism, attached to a large reflector.

12. Peculiarities of spectra, including the relative intensities of lines, especially of those of wave lengths 4216, 4455, etc. Study of lines of great and small wave-lengths. Intensity of light of different wave-lengths.

13. Radial velocities of stars, including all of magnitude 6.0, and brighter, with a computed probable error not exceeding 3 km. Radial velocities of a selected list of stars like those in No. 8.

14. Radial velocities of spectroscopic binaries. Minimum number of good determinations forty, with at least one in each twenty-fourth of the period.

15. Photographic and photovisual magnitudes of a Durchmusterung of all stars of the ninth magnitude, and brighter, on the international scale. It may be best to begin with 40,000 stars, one in each square degree of about the ninth magnitude, or with the standard stars of No. 3.

16. Photographic and photovisual magnitudes of selected lists of faint stars.

17. Photometric, photographic, or visual determinations of the brightness of all variables of long period, or irregular, having a range of four magnitudes, or more, or three magnitudes when of the ninth magnitude, or brighter, at maximum.

18. Light curve of all variables of short period. For the bright stars the photoelectric cell should be used. Dividing the period into twenty-four equal parts, a point on the curve should be determined in each of these parts with a probable error not exceeding ± 0.02 magn. Observations should be made every five years, at phases when the light is changing most rapidly, to determine the variations in the period. In the case of globular clusters and the Magellanic Clouds, photographs with large reflectors are much to be desired to extend the work to the fainter stars.

19. Measures like those of No. 18 of all Algol variables. In addition, at least twenty points should be determined at nearly equal intervals during the primary, and secondary minimum, if any exists.

20. A catalogue of all stars of the magnitude 6.5, and brighter, giving for each the approximate position, proper motion, radial velocity, parallax, magnitude, spectrum, color index, etc. The type to be kept standing and a new edition issued every three years, giving corrected values computed by experts who should maintain a bibliography accessible to all investigators.

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